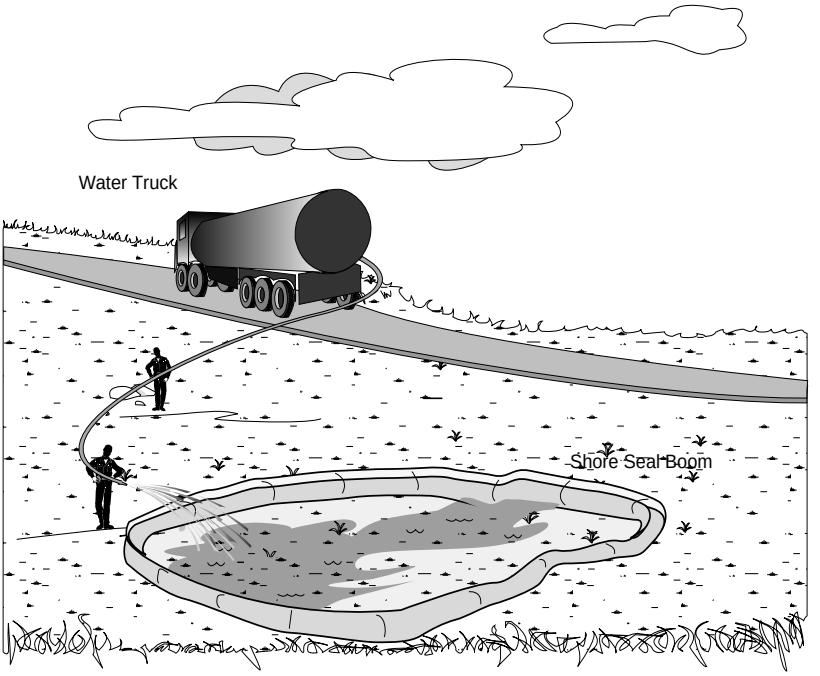


Use flooding to introduce water onto the tundra at a spill site. The nature of the spilled substance determines the purpose of flooding:

- *Crude Oil and Diesel Spills*: Flooding raises or maintains the water level in the tundra to reduce the infiltration of oil into the root zone and subsurface soil or to reduce the amount of oil contacting vegetation foliage. The floating oil then can be recovered with skimmers (Tactic T-7) or sorbents (Tactic T-4). Repeated flooding and pumping have been shown to greatly increase recovery of spill residue.
- *Water-Soluble Substances (methanol, glycol, salts)*: Flooding dilutes spills to reduce the toxicity to the tundra. The diluted spill can be recovered by repeated flooding and pumping (Tactic T-7).

Generally, low pressures and cold or warm (<106°F) water temperatures are used. Water may be obtained from a nearby tundra pond or creek. Do not use seawater or produced water to flood tundra vegetation. Flooding must be contained using land barriers (Tactic T-3).

Note that flooding is different than *flushing* (Tactic T-2).

Flooding may also be used to irrigate (Tactic T-15) a site during the growing season.

## APPLICABILITY

| | APPLICABILITY | COMMENTS |
|---|---|---|
| SPILLED SUBSTANCE | All | • Weathered crude oil may mix with the water.<br>• Diesel may float initially but will mix with the water. |
| TUNDRA TYPE | All | • In dry tundra, saturation of pore spaces in root mat or soil will decrease space for contaminant to occupy.<br>• In wet tundra, flooding will increase water levels to make skimming more effective. |
| SEASON | Spring, summer, fall | • Frozen soil should not be thawed to the point that contamination can infiltrate root mat.<br>• Flooding is a viable option only when air temperatures permit. |

## CONSIDERATIONS AND LIMITATIONS

- Avoid impacting higher topographical features (e.g., raising the water level in a spill-affected area may expose initially unaffected tussocks).
- Avoid high water pressures (>50 pounds per square inch) that could damage tundra.
- **Warm water** (<106°F) may be more effective than cold water (Alaska Clean Seas, 1999).
- Ensure that land barriers (Tactic T-3) are built to withstand increased water content in the spill area.
- This tactic has been adapted from Tactic R-4 in the *Alaska Clean Seas Technical Manual* (Alaska Clean Seas, 1999, Vol. 1) and has been used in treating crude-oil-affected moist and wet tundra on the North Slope with acceptable short-term results (Jorgenson and Cater, 1996; Cater and Jorgenson, 1999). Information on the effectiveness of this tactic is based on field observations, not controlled experiments. No test data exist which document whether the use of this tactic results in long-term benefits to tundra restoration compared with other tactics, combinations of tactics, or "no action."

## EQUIPMENT, MATERIALS, AND PERSONNEL

- Water truck or upright tank (1 operator) - to provide water source
- Pumps and suction and discharge hose (1 to 2 operators each)
- Land barriers (Tactic T-3)
- Clean water (not saltwater)